CLAIMS

What is claimed is:

1. A multi-tune radio frequency (RF) coil, comprising:

a first RF coil, comprising:

a first end ring having a generally annular opening; and

a first plurality of elongated segments coupled to and positioned circumferentially around the first end ring, wherein the first plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance;

a second RF coil, comprising:

a second end ring having a generally annular opening;

a second plurality of elongated segments coupled to and positioned circumferentially around the second end ring, wherein the second plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance; and

at least one of a third end ring having a generally annular opening and an end cap, wherein the first and second plurality of elongated segments are coupled to and positioned circumferentially around the at least one of the end cap and the third end ring, thereby forming a coil volume, and the first and second plurality of elongated segments lie in a same circumferential plane.

2. The coil of claim 1, wherein the end cap comprises a plurality of copper sheets, and the plurality of copper sheets are interconnected via a plurality of shorting capacitors.

3. The coil of claim 1, further comprising at least one electronic component, wherein the at least one electronic component is located behind the end cap and outside the coil volume.

4. The coil of claim 1, wherein the first RF coil and the second RF coil are in a low pass configuration.

5. The coil of claim 1, wherein the first RF coil is in a high pass configuration and the second RF coil is in a low pass configuration.

6. The coil of claim 5, further comprising a phase shifter coupled to a plurality of drive points that are symmetrically opposite from one another.

7. The coil of claim 6, wherein the phase shifter comprises an LC circuit.

8. The coil of claim 1, wherein the first RF coil and the second RF coil are volume type coils.

9. The coil of claim 1, wherein the first RF coil is driven at a principle mode of ±45 degrees to a vertical axis and the second RF coil is driven at a principle mode of 30 degrees and -60 degrees to a vertical axis.

10. The coil of claim 8, wherein the first RF coil is a phosphorus coil and the second RF coil is a proton coil.

11. The coil of claim 8, wherein the principle modes are impedance matched at a nuclear magnetic resonant (NMR) frequency.

12. The coil of claim 11, wherein the principle modes are matched using capacitive matching.

13. The coil of claim 11, wherein the principle modes are matched using inductive matching.

14. The coil of claim 11, wherein the principle modes are matched using capacitive matching and inductive matching.

15. The coil of claim 11, wherein the principle modes are matched to about 50 ohms.

16. The coil of claim 11, wherein the matched outputs are combined using a quadrature hybrid coupler.

17. The coil of claim 1, further comprising an RF filter to reduce electrical coupling between the first RF coil and the second RF coil.

18. The coil of claim 17, wherein the RF filter is a two stage Chebyshev filter.

19. The coil of claim 1, wherein the first end ring and the second end ring are magnetically coupled.

20. The coil of claim 1, further comprising a platform, wherein the coil is operatively coupled to the platform to facilitate positioning of the coil relative to an object on the platform.

21. The multi-tune coil of claim 1, wherein the coil is tuned for concurrent magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS).

22. A multi-tune radio frequency (RF) coil for concurrent magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS), comprising:

a first RF coil, comprising:

a first end ring having a generally annular opening;

a second end ring having a generally annular opening; and

a first plurality of elongated segments coupled to and positioned circumferentially around the first end ring and the second end ring, thereby forming a coil volume, wherein the first plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance; and

a second RF coil, comprising:

a third end ring having a generally annular opening;

a fourth end ring having a generally annular opening; and

a second plurality of elongated segments coupled to and positioned circumferentially around the third end ring and the fourth end ring, thereby forming a coil volume, wherein the second plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance, and wherein the first and second plurality of elongated segments lie in a same circumferential plane.

23. A system comprising the coil of claim 1, and further comprising a means for driving the coil during magnetic resonance scanning.

24. A magnetic resonance scanning system, comprising:

a multi-tune coil as recited in claim 1; and

means for processing RF signals which are at least one of received from the multi-tune coil and transmitted from the RF coil in order to obtain a magnetic resonance scan.

25. A multi-tune radio frequency (RF) coil, comprising:

a first RF coil, comprising:

a first end ring having a generally annular opening; and

a first plurality of elongated segments coupled to and positioned circumferentially around the first end ring, wherein the first plurality of

elongated segments are azimuthally offset from one another by a substantially equal angular distance;

a second RF coil, comprising:

a first cylinder formed by a second plurality of elongated segments, wherein the second plurality of elongated segments are azimuthally offset from one another by a substantially equal angular distance;

a second cylinder, wherein the first cylinder is within the second cylinder; and

an end cap, wherein the first and second plurality of elongated segments are coupled to and positioned circumferentially around the end cap, thereby forming a coil volume, and the first and second plurality of elongated segments lie in a same circumferential plane.

26. The multi-tune coil of claim 25, wherein the first RF coil is birdcage coil and the second RF coil is a cavity resonator.

27. The multi-tune coil of claim 26, wherein a tuning frequency of the cavity resonator is greater than a tuning frequency of the birdcage coil.